

01/10/00

U.S. PTO

CALIFORNIA OFFICE

2000

55
C542 U.S. PTO
09/480107

01/10/00

Docket No. : 0465-0656P-SP

Figure 1

MAIL ADDRESS: P.O. BOX 747, FALLS CHURCH, VIRGINIA, USA 22040-0747

Other _____

The filing fee has been calculated as shown below:

LARGE ENTITY				SMALL ENTITY			
FOR	NO. FILED	NO. EXTRA	RATE	FEE		RATE	FEE
BASIC FEE	***** ***** *****	***** ***** *****	***** ***** *****	\$690.00	or	**** **** ****	\$345.00
TOTAL CLAIMS	9 - 20 =	0	x18 = \$	0.00	or	x 9 = \$	0.00
INDEPENDENT	1 - 3 =	0	x78 = \$	0.00	or	x 39 = \$	0.00
MULTIPLE DEPENDENT CLAIM PRESENTED <u>no</u>				+260 = \$	or	+130 = \$	0.00
TOTAL \$				690.00		TOTAL \$	0.00

X A check in the amount of \$ 730.00 to cover the filing fee and recording fee (if applicable) is enclosed.

____ Please charge Deposit Account No. 02-2448 in the amount of \$ _____. A triplicate copy of this transmittal form is enclosed.

____ No fee is enclosed.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. 1.16 or under 37 C.F.R. 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 

JOSEPH A. KOLASCH

Reg. No. 22,463

P. O. Box 747

Falls Church, Virginia 22040-0747

OPTICAL RECORDING MEDIUM AND METHOD FOR FORMATTING

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to an optical recording medium and more particularly to a method of formatting a rewritable optical recording medium.

Discussion of Related Art

0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200
2201
2202
2203

from an optical storage medium. Also, defective areas of a rewritable optical disc may be caused by a scratch on its surface, particles of dirt and dust, or errors during manufacture. Therefore, in order to prevent writing into or reading out of the defective area, management of such defective areas is necessary.

FIG. 1 shows a defect management area (DMA) in a lead-in area and a lead-out area of the optical disc to manage a defect area. Particularly, the data area is divided into a plurality of zones for the defect area management, where each zone is further divided into a user area and a spare area. The user area is where data is actually written and the spare area is used when a defect occurs in the user area.

There are four DMAs in one disc, e.g. DVD-RAM, two of which exist in the lead-in area and two exist in the lead-out area. Because managing defective areas is important, the same contents are repeatedly recorded in all four DMAs to protect the data. Each DMA comprises two blocks of 32 sectors, where one block comprises 16 sectors. The first block of the DMA, called a DDS/PDL block, includes a disc definition structure (DDS) and a primary defect list (PDL). The second block of the DMA, called an SDL block, includes a secondary defect list (SDL). The PDL corresponds to a primary defect data storage

and the SDL corresponds to a secondary defect data storage.

The PDL generally stores entries of defective sectors caused during the manufacture of the disc or identified when formatting a disc, namely initializing and re-initializing a disc. Each entry is composed of an entry type and a sector number corresponding to a defective sector. The SDL lists defective areas in block units, thereby storing entries of defective blocks occurring after formatting or defective blocks which could not be stored in the PDL during the formatting. Each SDL entry has an area for storing a sector number of the first sector of a block having defective sectors, an area for storing a sector number of the first sector of a block replacing the defective block, and reserved areas. Accordingly, defective areas, i.e. defective sectors or defective blocks, within the data area are replaced with normal or non-defective sectors or blocks by a slipping replacement algorithm and a linear replacement algorithm.

The slipping replacement algorithm is utilized when a defective area is recorded in the PDL. As shown in FIG. 2A, if defective sectors m and n, corresponding to sectors in the user area, are recorded in the PDL, such defective sectors are skipped to the next available sector. By replacing the defective sectors by subsequent sectors, data is written to a

normal sector. As a result, the user area into which data is written slips and occupies the spare area in the amount equivalent to the skipped defective sectors. For example, if two defect sectors are registered in the PDL, data would occupy two sectors of the spare area.

The linear replacement algorithm is utilized when a defective block is recorded in the SDL or when a defective block is found during playback. As shown in FIG. 2B, if defective blocks m and n, corresponding to blocks in either the user or spare area, are recorded on the SDL, such defective blocks are replaced by normal blocks in the spare area and the data to be recorded in the defective block are recorded in an assigned spare area.

As defective areas are compensated utilizing the spare area, methods of assigning the spare area plays an important role in the defective area management. Typically, the spare area may be allocated in each zone or group of the data area or may be allocated in a designated portion of the data area. One method is to allocate the spare area at the top of the data area, as shown in FIG. 3. In such case, the spare area is called a Primary Spare Area. Namely, the data area excluding the primary spare area becomes the user area.

The primary spare area, assigned in an initial formatting

process, is assigned when a manufacturer produces the optical disc or when a user initially formats an empty disc. Moreover, when defect sectors are registered in the PDL according to the initial formatting or reformatting of optical disc, data cannot be recorded in those defect sectors, reducing the recording capacity. Therefore, to maintain the initial data recording capacity, a portion of the primary spare area equivalent to the defective sectors registered on the PDL slips into or becomes a part of the user area during formatting. Accordingly, the PSN of the user area to which a value of LSN=0 is assigned varies depending upon the defective sectors registered on the PDL.

If the primary spare area becomes full by slipping or linear replacement, as shown in FIG. 4A, a new spare area may be assigned, for example near the end of the user area. Such additional spare area is called a supplementary spare area (SA-sup). The location information of the supplementary spare area is stored in a specific area such as in the SDL block of the DMA. Particularly, the location information includes the start address (the first sector number) and the end address (the last sector number) of the assigned supplementary spare area. Thus, the size as well as the location of the supplementary spare area can be ascertained from the

information.

The assigned supplementary spare area may be enlarged when necessary as shown in FIG. 4B. Also, the location of the extended supplementary spare area is stored in the specific area of the DMA as in the initial assignment of the supplementary spare area. However, since a location information is already stored in the DMA, the start address of the location information is modified. As a result, the location information of the supplementary spare area is modified each time the supplementary spare area is enlarged.

Moreover, even in optical recording mediums with assigned supplementary spare area as described above, defect sectors or blocks are registered in the PDL or SDL for defect area management. Accordingly, linear replacement and slipping replacement is utilized. However, for linear replacement, the optical pick-up must be transferred to and back from the spare area to the user area in order to record data for the defect blocks registered in the SDL within the assigned replacement blocks. Repetition of this may deteriorate the system performance. As a result, the optical medium is reformatted to move the defect sectors registered in the SDL to the PDL, thereby reducing the number of linear replacements and improving the system performance.

The reformatting method is classified into a full formatting through certification and a simple formatting by which the SDL is transferred to the G₂-list of the PDL without certification process in order to reduce the formatting time.

5 The P-list remains unchanged after the completion of the formatting but defective blocks of the SDL are stored as defective sectors in the G₂-list. Thus, the G₂-list may include defective sectors as well as normal sectors. Nevertheless, the normal sectors is considered as defect sectors.

The full formatting, shown in Fig. 5A, reads the old DMA information and certifies all data area other than the defect sectors registered in the P-list of the old PDL. Rather, the P-list of the old PDL is converted to the P-list of the new PDL without any change. Furthermore, a full formatting disposes of the G₁-list and G₂-list of the old PDL as well as the old SDL and then registers defect sectors found during the certification in the G₁-list of the new PDL.

20 In contrast, the simple formatting, shown in Fig. 5B, converts the SDL to the G₂-list without certification. Namely, the old DMA information is read and sectors in the P-list, G₁-list and G₂-list of the old PDL are converted to the P-list, G₁-list and G₂-list of a new PDL. Also, after converting the

old SDL entries to sixteen PDL entries, the converted SDL entries are disposed and the new PDL entries are registered in the G_2 -list of the new PDL.

Upon execution of a reformatting, the supplementary spare area is considered to be non-existent by the file system because the defect information of the SDL has been moved to the PDL. However, the location information of the supplementary spare area is maintained without change in the SDL block. Thus, an assignment of the supplementary spare area is still considered to be existent by the driver, namely the physical driver. Because the file system recognizes whether a formatting has been executed while the driver cannot, the file system and the driver have inconsistent information regarding the supplementary spare area. Accordingly, different judgements between the file system and driver regarding the supplementary spare area may cause problems in the system control.

Furthermore, a compatibility problem occurs when an optical recording medium as described above is transferred to other drivers. Specifically, when the optical recording medium is inserted into other driver, the driver first reads the DMA from the optical recording medium and informs the file system. Then, the file system constructs a new file system using the

information delivered from the driver. At this time, since the location information of the supplementary spare area is still recorded in the SDL block of the DMA, the location information is also sent to the file system together with the information from the driver. Accordingly, the file system regards that the supplementary spare area has been assigned. As a result, the area registered in the SDL block is considered to be actual supplementary spare area and is excluded when assigning the supplementary spare area or when executing linear replacement, thereby producing problems in compatibility.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to solve at least the problems and disadvantages of the related art.

An object of the present invention is to provide an optical recording medium in which the location information of a supplementary spare area registered in the DMA is reset after a formatting the optical recording medium.

Another object of the present invention is to provide a method of formatting an optical recording medium, which resets the location information of a supplementary spare area registered in the DMA when the optical recording medium is

formatted.

Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objects and advantages of the invention may be realized and attained as particularly pointed out in the appended claims.

To achieve the objects and in accordance with the purposes of the invention, as embodied and broadly described herein, a method of formatting an optical recording medium includes resetting the location information of the supplementary spare area and converting the assigned supplementary spare area to a writable area. In the present invention, the location information of the supplementary spare area is stored in a specific area of the optical recording medium. In the preferred embodiment, the location information of the supplementary spare area is stored in the SDL of the DMA.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

The invention will be described in detail with reference to the following drawings in which like reference numerals

refer to like elements wherein:

Fig. 1 shows a structure of a general optical recording medium in the related art;

Fig. 2A shows a slipping replacement algorithm in the related art;

Fig. 2B shows a linear replacement algorithm in the related art;

Fig. 3 shows when a spare area is assigned at the top of the data area;

Figs. 4A and B show assigning and expanding supplementary spare area in a disc with a primary spare area as shown in Fig. 3;

Fig. 5A shows an example of a full formatting with certification;

Fig. 5B shows an example of a simple formatting without certification; and

Fig. 6 a flow diagram showing a method of formatting the optical recording medium according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

Generally, the present invention resets the location information of the supplementary spare area registered in the SDL block when an optical recording medium is formatted. Thus, the judgments of the file system and the driver would match with respect to the supplementary spare area. Fig. 6 is a flow diagram showing the operation of a driver when formatting the optical recording medium according to the present invention.

Referring to Fig. 6, upon receiving a formatting command (step 601), a judgement is made if a supplementary spare area has been assigned (step 602). If the supplementary spare area exists, the location information of the supplementary spare area recorded in the DMA is reset (step 603). To reset the location information of the supplementary spare area, any one of a variety of methods may be utilized. In one example, all the location information values of the supplementary spare area may be converted to the lowest value (for example, 00h) or the highest value (for example, FFh). In another example, the location information may be converted into a specific code value according to a predetermined agreement. That is, the location information value may converted to a value which would allow the file system to recognize that the location information of the supplementary spare area has been reset when the file system receives the DMA information from the

driver.

After resetting the location information of the supplementary spare area in step 603 or if a supplementary spare area has not been assigned as determined in step 602, a judgement is made whether the formatting is with certification (step 604). If the formatting is with certification, all sectors, including the sectors registered in the PDL and the SDL, is certified as shown in Fig. 5A (step 605). Thus, sectors judged to have defects are registered in the new PDL. On the other hand, if the formatting is judged to be without certification, all sectors registered in the SDL is registered in the new PDL without change as shown in Fig. 5B (step 606).

Upon completion of formatting as described above, the sectors of the supplementary spare area equivalent the defective sectors registered on the new PDL slips into and becomes a part of the user area to maintain the initial data recording capacity. At this time, recognizing that a formatting has been performed, the file system disposes the information of the supplementary spare area. Accordingly, the information of the supplementary spare area is disposed from both the driver and the file system after a formatting.

In the above embodiment, the location information of the supplementary spare area is reset prior to the formatting when

a formatting command is input. However, the location information of the supplementary spare area may be reset after the formatting. In such case, steps 604 ~ 606 would proceed prior to steps 602 ~ 603 when a formatting command is received in step 601.

Thus, according to the optical recording medium and method of formatting the optical recording medium in present invention, the location information of the supplementary spare area registered in the DMA is reset when the optical recording medium is formatted. This allows the judgements of the file system and the driver regarding the supplementary spare area to match, thereby leading to a consistent system control and maintenance of compatibility when the optical recording medium is transferred to different drivers.

The foregoing embodiments are merely exemplary and are not to be construed as limiting the present invention. The present teachings can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.

What is claimed is:

1. A method of formatting an optical recording medium comprising:

- (a) resetting a location information of a supplementary spare area; and
- (b) converting the supplementary spare area to a user area.

2. A method of claim 1, further comprises determining if a supplementary spare area has been assigned prior to (a) and (b), wherein resetting the location information of a supplementary spare area and converting the supplementary spare area to a user area, if a supplementary spare area has been assigned.

3. A method of claim 1, wherein (a) comprises converting the location information of the supplementary spare area to a predetermined value which indicates that the location information of the supplementary spare area has been reset.

4. A method of claim 3, wherein the predetermined value

Abstract of Disclosure

An optical recording medium and method of formatting the optical recording medium is disclosed. In the present invention, the location information of the supplementary spare area, if assigned, is reset when the optical recording medium is formatted. The resetting of the location information results in consistency between a file system and a driver of the optical recording medium with respect to the supplementary spare area.

FIG.1
Related Art

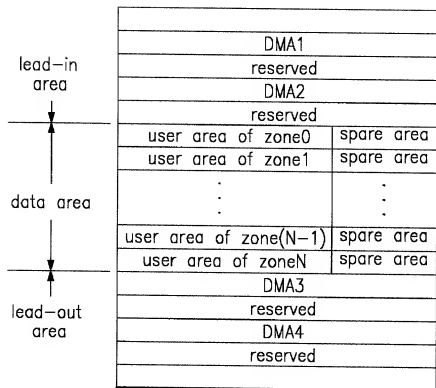


FIG.2A
Related Art

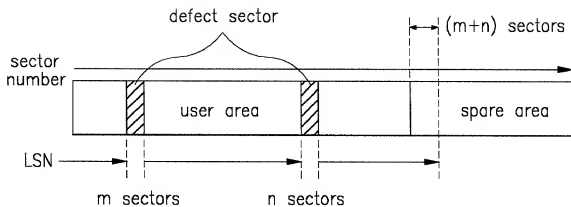


FIG.2B
Related Art

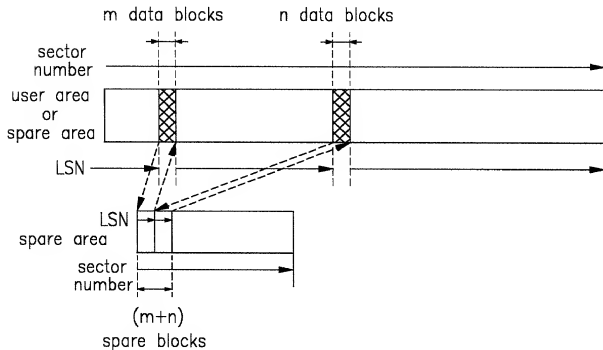
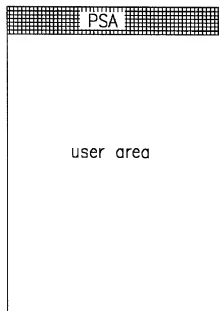


FIG.3
Related Art



09480107-011000

FIG.4
Related Art

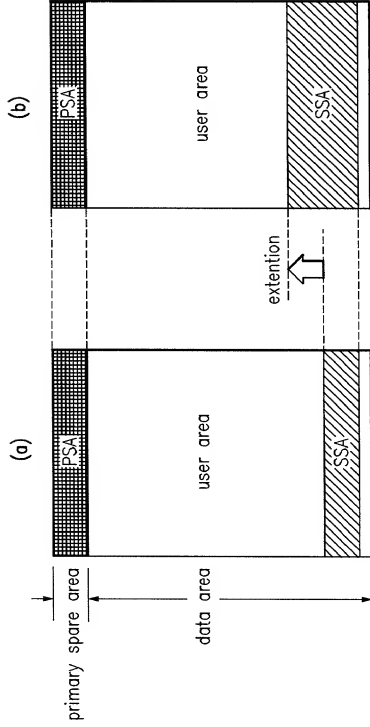


FIG.5A
Related Art

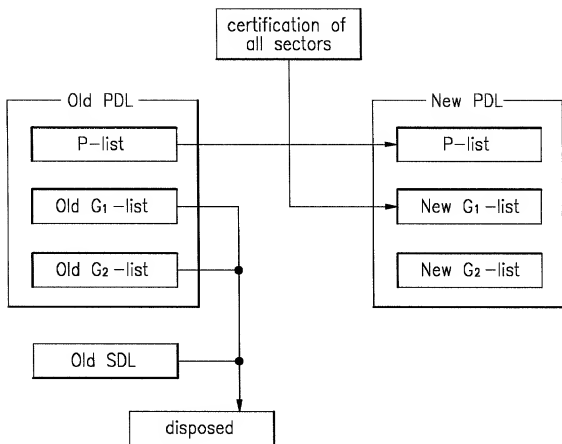


FIG.5B
Related Art

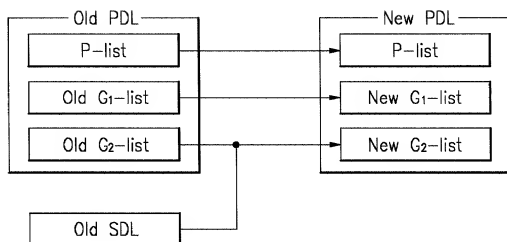
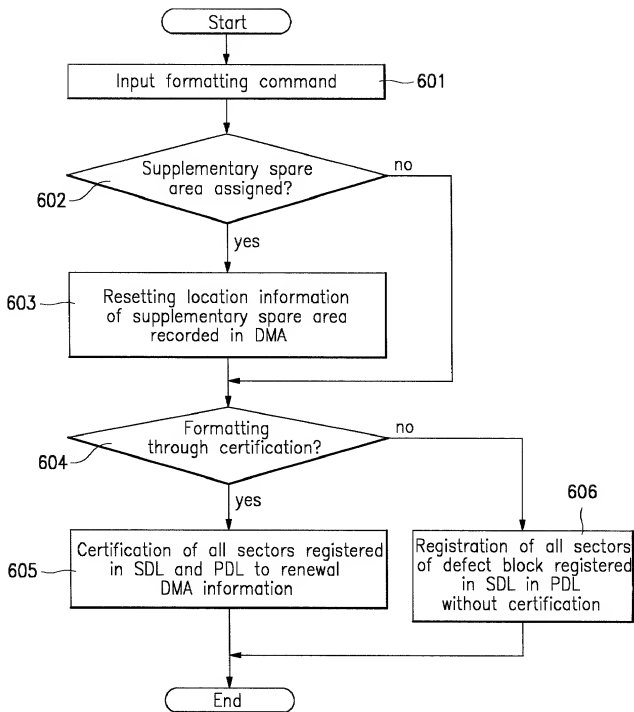


FIG.6



PLEASE NOTE:
YOU MUST
COMPLETE THE
FOLLOWING:

COMBINED DECLARATION AND POWER OF ATTORNEY
FOR PATENT AND DESIGN APPLICATIONS

ATTORNEY DOCKET NO.
465-656P

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated next to my name; that I verily believe that I am the original, first and sole inventor (if only one inventor is named below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Insert Title:

OPTICAL RECORDING MEDIUM AND METHOD FOR FORMATTING

Fill in Appropriate
Information -
For Use Without
Specification
Attached:

the specification of which is attached hereto. If not attached hereto,

the specification was filed on _____ as
United States Application Number _____; and /or

the specification was filed on _____ as PCT
International Application Number _____; and was
amended under PCT Article 19 on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Insert Priority
Information:
(if appropriate)

Prior Foreign Application(s)

(Number)	Country	January 23, 1999 (Month/Day/Year Filed)	Priority Claimed
(Number)	(Country)	(Month/Day/Year Filed)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No
(Number)	(Country)	(Month/Day/Year Filed)	<input type="checkbox"/> Yes <input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.

Insert Provisional
Application(s):
(if any)

(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

All Foreign Applications, if any, for any Patent or Inventor's Certificate Filed More Than 12 Months (6 Months for Designs) Prior To The Filing Date of This Application:

Insert Requested
Information:
(if appropriate)

Country	Application No	Date of Filing (Month/Day/Year)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Insert Prior U.S.
Application(s):
(if any)

(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)
(Application Number)	(Filing Date)	(Status - patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

Terrell C. Birch (Reg. No. 19,382)
Joseph A. Kolasch (Reg. No. 22,463)
Bernard L. Sweeney (Reg. No. 24,448)
Charles Gorenstein (Reg. No. 29,271)
Leonard R. Svensson (Reg. No. 30,330)
Andrew D. Meikle (Reg. No. 32,868)
Joe McKinney Muncy (Reg. No. 32,334)
C. Joseph Faraci (Reg. No. 32,350)

Raymond C. Stewart (Reg. No. 21,066)
James M. Slattery (Reg. No. 28,380)
Michael K. Mutter (Reg. No. 29,680)
Gerald M. Murphy, Jr. (Reg. No. 28,977)
Terry L. Clark (Reg. No. 32,644)
Marc S. Weiner (Reg. No. 32,181)
Andrew F. Reish (Reg. No. 33,443)
Donald J. Daley (Reg. No. 34,313)

Send Correspondence to:

BIRCH, STEWART, KOLASCH & BIRCH, LLP

P.O. Box 747 • Falls Church, Virginia 22040-0747

Telephone: (703) 205-8000 • Facsimile: (703) 205-8050

PLEASE NOTE:
YOU MUST
COMPLETE THE
FOLLOWING:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First or Sole
Inventor:
Insert Name of Inventor
Insert Date this
Document is Signed

Insert Residence
Insert Citizenship

Insert Post Office
Address

Full Name of Second
Inventor, if any:

see above

Full Name of Third
Inventor, if any

see above

Full Name of Fourth
Inventor, if any

see above

Full Name of Fifth
Inventor, if any

see above

GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Yong Cheol	PARK	<i>Park Yong Cheol</i>	Nov. 22, 1999
Residence (City, State & Country)		CITIZENSHIP	
Kyonggi-do, Korea		Republic of Korea	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
Jugong APT. 215-204, Wonmun-dong, Kwachon-shi, Kyonggi-do, Korea			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			

* DATE OF SIGNATURE

09480107-011000